OBSERVATIONS & RECOMMENDATIONS

After reviewing data collected from **TOLMAN POND** the program coordinators recommend the following actions. *Please note, three years of data does not signify an accurate trend for lake quality. It will be a few more years before we can determine the trends for Tolman Pond.*

FIGURE INTERPRETATION

- Figure 1: These graphs illustrate concentrations of chlorophyll-a in the water column. Algae are microscopic plants that are a natural part of lake ecosystems. Algae contain chlorophyll-a, a pigment necessary for photosynthesis. A measure of chlorophyll-a can indicate the abundance of algae in a lake. The historical data (the bottom graph) show in-lake chlorophyll-a is *fairly stable*, although the best-fit line shows an improving trend. The best-fit line was skewed by the high result in 1998. The chlorophyll-a concentration increased from the 1999 season, but remains well below the New Hampshire mean. The increase in rainfall this season flushed excess nutrients into the pond through runoff, and erosion problems contributed to the nutrient load in the pond. This can often result in increased algal growth. While algae are present in all lakes, an excess amount of any type is not welcomed. Concentrations can increase when there are external and internal sources of phosphorus, which is the nutrient algae depend upon for growth. It's important to continue the education process and keep residents aware of the sources of phosphorus and how it influences lake quality.

- Figure 2: Water clarity is measured by using a Secchi disk. Clarity, or transparency, can be influenced by such things as algae, sediments from erosion, and natural colors of the water. The graphs on this page show historical and current year data. The lower graph shows lake transparency is *improving*. The mean transparency was higher this season and was only slightly below the New Hampshire mean. The Secchi disk was even seen on the bottom of the pond in June. The 2000 sampling season was considered to be wet and, therefore, average transparency readings are expected to be slightly lower than last year's readings. Higher amounts of rainfall usually cause more eroding of sediments into the lake and streams, thus decreasing clarity.

- Figure 3: These figures show the amounts of phosphorus in the epilimnion (the upper layer in the lake) and the hypolimnion (the lower layer); the inset graphs show current year data. Phosphorus is the limiting nutrient for plants and algae in New Hampshire waters. Too much phosphorus in a lake can lead to increases in plant growth over time. In-lake phosphorus concentration *increased* this season. The June concentration was above the New Hampshire median for lakes and ponds. The erosion of two inlets increased the sediment load to the pond, which would likely cause elevated phosphorus concentrations. A continuation of this trend can lead to excess algal growth, which would then lead to a possible reduction in clarity. One of the most important approaches to reducing phosphorus levels is educating the public. Humans introduce phosphorus to lakes by several means: fertilizing lawns, septic system failures, and detergents containing phosphates are just a few. Keeping the public aware of ways to reduce the input of phosphorus to lakes means less productivity in the lake. Contact the VLAP coordinator for tips on educating your lake residents or for ideas on testing your watershed for phosphorus inputs.

OTHER COMMENTS

- Conductivity levels were slightly increased throughout the watershed this year (Table 6). The noted erosion at the North Inlet and Road Culvert Inlet likely contributed to these increases. The Road Culvert Inlet did not experience the excessively high conductivity levels observed in 1999. While the conductivity levels in the Tolman Pond watershed are not considered to be high, the increases are not welcomed. Contact the VLAP Coordinator to discuss some options to reduce the erosion at these sites.

- The Road Culvert Inlet had a total phosphorus mean in the excessive range this year (Table 8; see also Chemical Monitoring Parameters section of the report). While the concentration did not reach the levels observed in 1999 the readings are considerably higher than the rest of the watershed. Again, the erosion problem would contribute to the excess nutrients entering into the inlet. It is evident that sediment was entering the inlet by examining the turbidity values for this summer (Table 11). Generally, turbidity values greater than 2 NTU indicate sediment in the sample.

- **Please note** on one occasion this summer the phosphorus concentration of the West Inlet was recorded as less than 5 µg/L. The NHDES Laboratory Services adopted a new method of reporting total phosphorus this year and the lowest value that can be recorded is 'less than 5 µg/L'. We would like to remind the association that a reading of 5 µg/L is considered low for New Hampshire's waters.

- Dissolved oxygen concentration was high throughout the water column (Table 9). Shallow ponds tend to mix continuously by wind and wave action, thereby allowing oxygen exchange with the atmosphere.

NOTES

- Monitor's Note (8/8/00): North Inlet road erosion into pond. Road Culvert Inlet has erosion from road causing filamentous algae problem. Large amounts of sand/silt washed in during rains. Silt fence in place, but water flows over top and bottom is blown out.

USEFUL RESOURCES

Stormwater Management and Erosion and Sediment Control Handbook. NHDES, Rockingham County Conservation District, USDA Natural Resource Conservation Service, 1992. (603) 679-2790.

A Brief History of Lakes, NH Lakes Association pamphlet, (603) 226-0299 or www.nhlakes.org

Lake Protection Tips: Some Do's and Don'ts for Maintaining Healthy Lakes, *WD-BB-9*, NHDES Fact Sheet, (603) 271-3503 or www.state.nh.us

Answers to Common Lake Questions, NHDES-WSPCD-92-12, NHDES Booklet, (603) 271-3503.

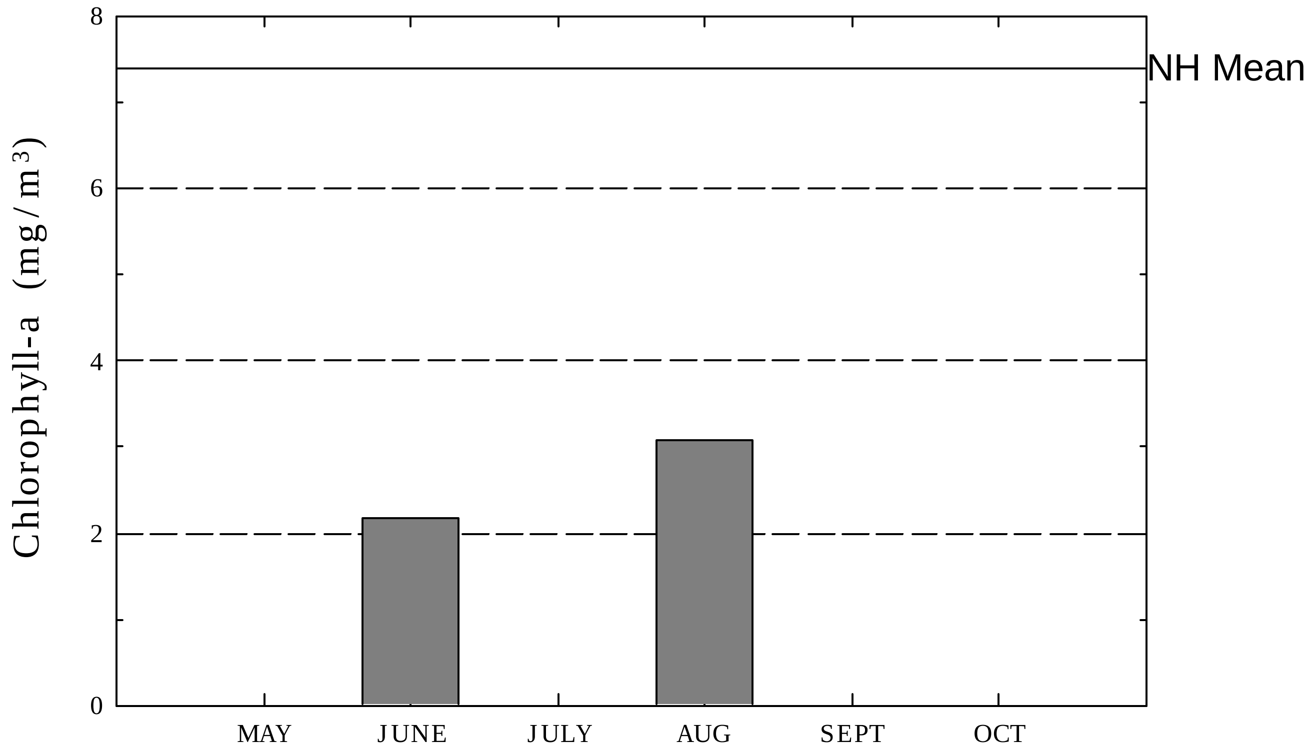
Anthropogenic Phosphorus and New Hampshire Waterbodies, *NHDES-WSPCD-95-6*, NHDES Booklet, (603) 271-3503

Vegetated Phosphorus Buffer Strips, NH Lakes Association pamphlet, (603) 226-0299 or www.nhlakes.org

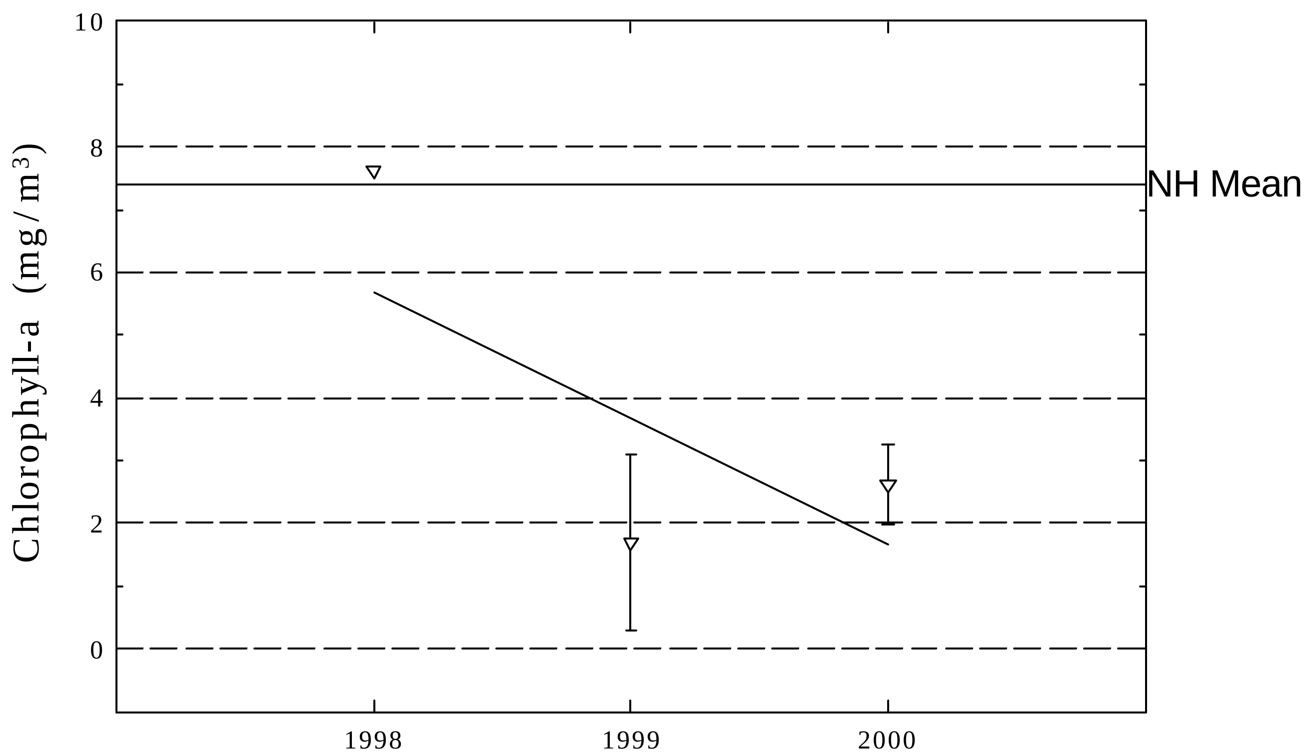
Erosion on Shorefront Property, NH Lakes Association pamphlet, (603) 226-0299 or www.nhlakes.org

Tolman Pond

Figure 1. Monthly and Historical Chlorophyll-a Results



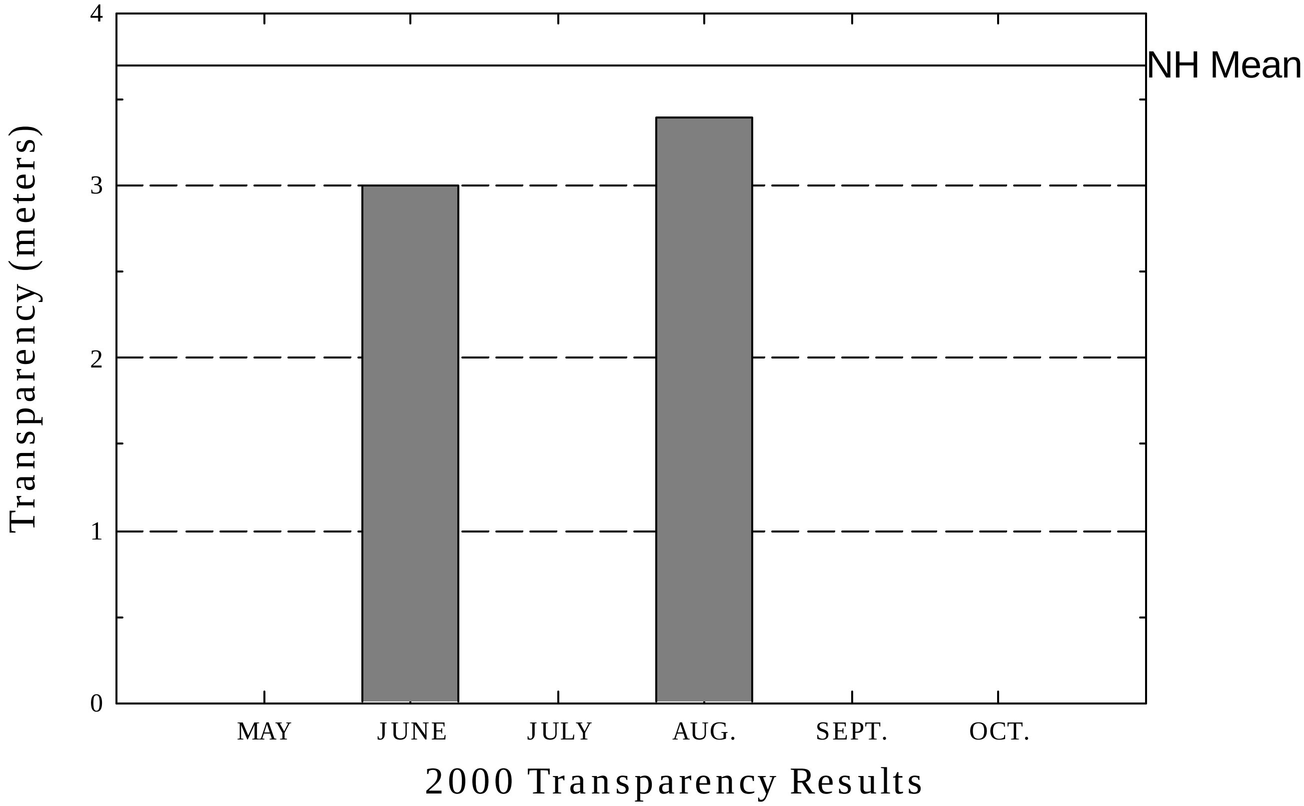
2000 Chlorophyll-a Results

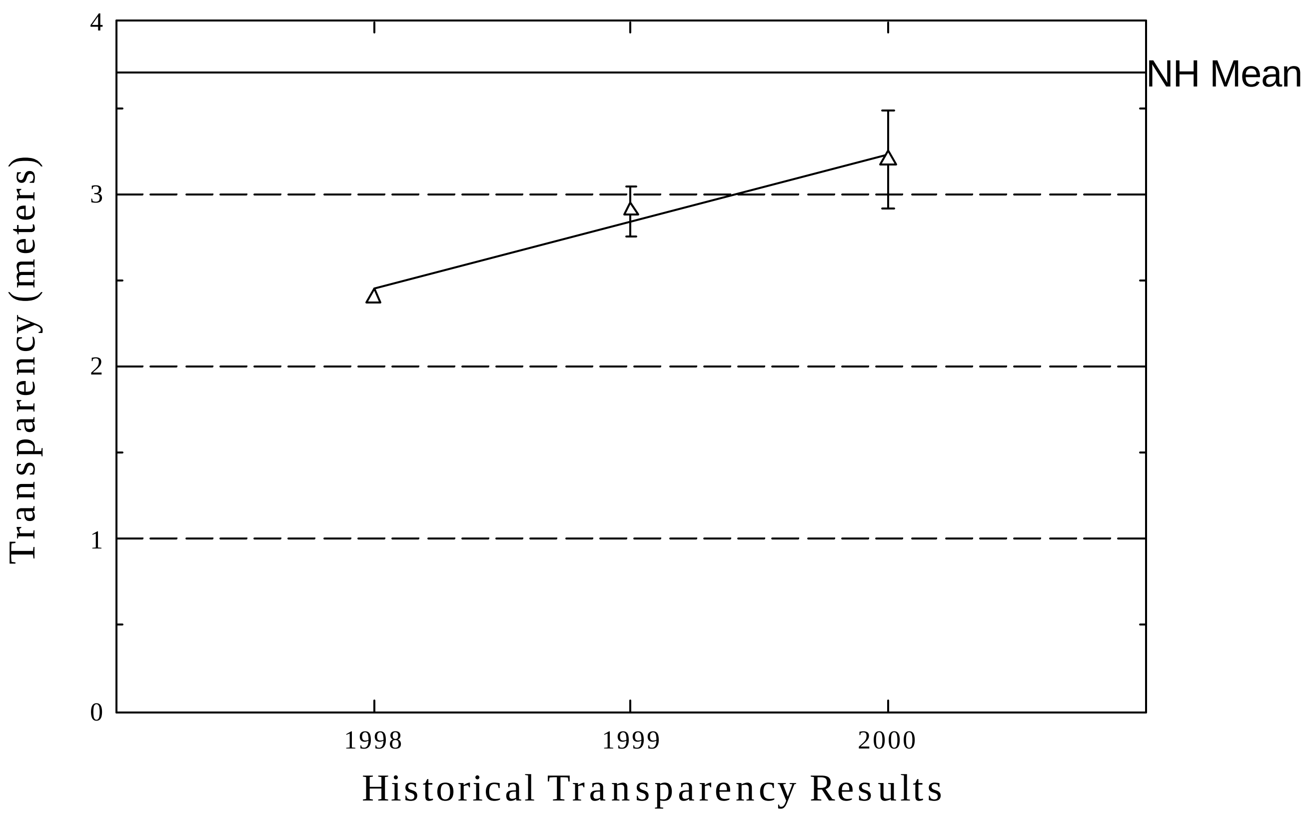


Historical Chlorophyll-a Results

Tolman Pond

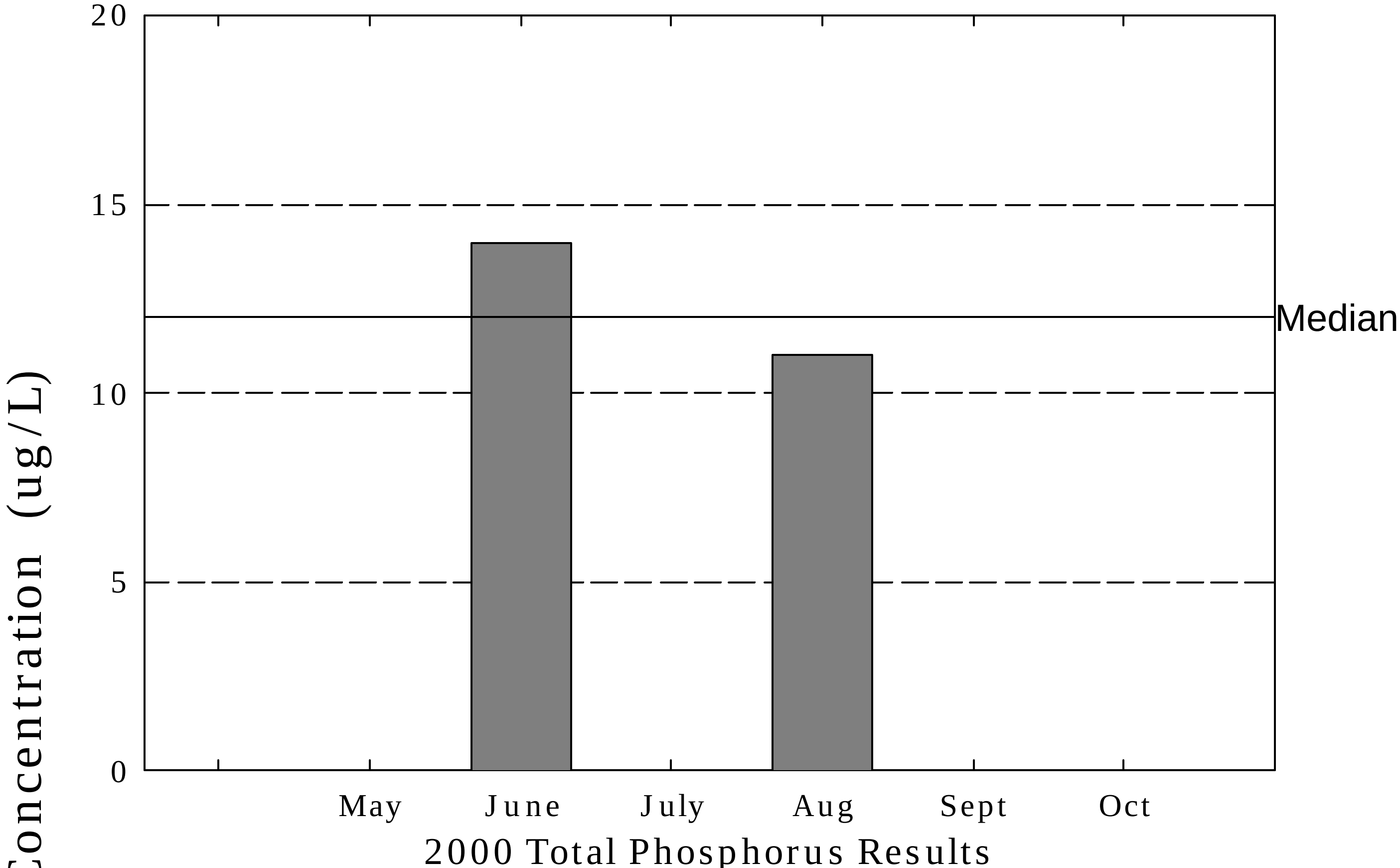
Figure 2. Monthly and Historical Transparency Results





Tolman Pond

Figure 3. Monthly and Historical Total Phosphorus Data.



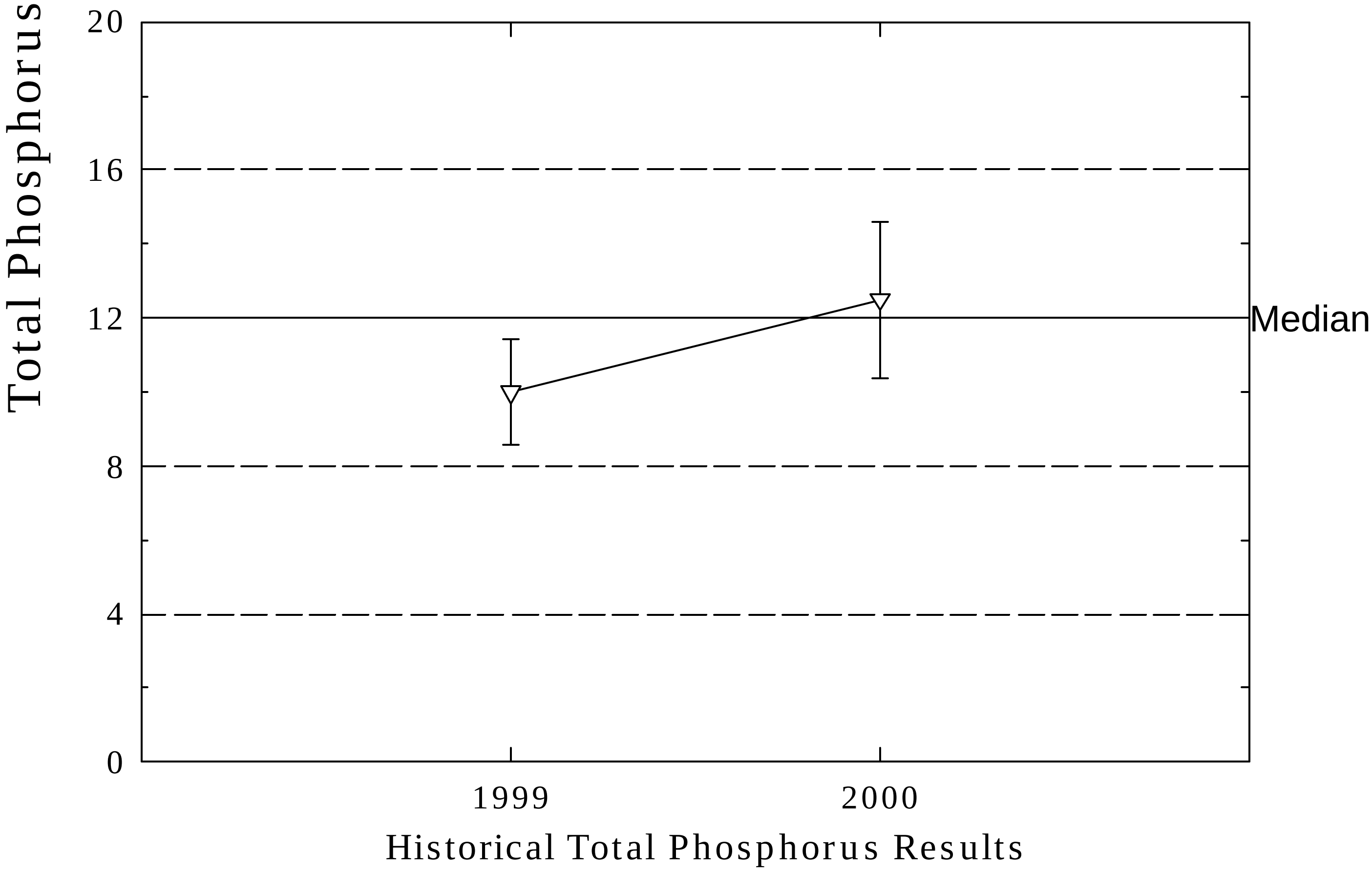


Table 1.

TOLMAN POND

NELSON

Chlorophyll-a results (mg/m^3) for current year and historical sampling periods.

Year	Minimum	Maximum	Mean
1998	7.63	7.63	7.63
1999	0.71	2.70	1.70
2000	2.18	3.08	2.63

Table 2.

TOLMAN POND

NELSON

Phytoplankton species and relative percent abundance.

Summary for current and historical sampling seasons.

Date of Sample	Species Observed	Relative % Abundance
07 / 28 / 1998	CERATIUM	35
	SPHAEROCYSTIS	19
	MICROCYSTIS	16
08 / 10 / 1999	MICROCYSTIS	29
	DINOBRYON	14
	MELOSIRA	14
08 / 08 / 2000	DINOBRYON	94
	ASTERIONELLA	5
	MALLOMONAS	1

Table 3.

TOLMAN POND

NELSON

Summary of current and historical Secchi Disk transparency results (in meters).

Year	Minimum	Maximum	Mean
1998	2.4	2.4	2.4
1999	2.8	3.0	2.9
2000	3.0	3.4	3.2

Table 4.

TOLMAN POND
NELSON

pH summary for current and historical sampling seasons.
Values in units, listed by station and year.

Station	Year	Minimum	Maximum	Mean
EPILIMNION				
	1998	6.46	6.46	6.46
	1999	6.48	7.09	6.69
	2000	6.72	6.78	6.75
NORTH INLET				
	1998	6.37	6.37	6.37
	1999	6.79	6.79	6.79
	2000	6.35	6.63	6.47
ROAD CULVERT INLET				
	2000	6.24	6.31	6.27
ROAD CULVERT				
	1999	5.98	6.69	6.20
WEST INLET				
	1999	6.53	6.53	6.53
	2000	6.67	6.70	6.68

Table 5.

TOLMAN POND

NELSON

Summary of current and historical Acid Neutralizing Capacity.
Values expressed in mg/L as CaCO .

Epilimnetic Values

Year	Minimum	Maximum	Mean
1998	6.00	6.00	6.00
1999	3.30	4.90	4.10
2000	3.50	3.90	3.70

Table 6.

TOLMAN POND

NELSON

Specific conductance results from current and historic sampling seasons. Results in uMhos/cm.

Station	Year	Minimum	Maximum	Mean
EPILIMNION				
	1998	30.3	30.3	30.3
	1999	27.8	29.0	28.4
	2000	30.3	31.6	31.0
NORTH INLET				
	1998	34.2	34.2	34.2
	1999	38.2	38.2	38.2
	2000	32.5	51.4	41.9
ROAD CULVERT INLET				
	2000	38.6	39.1	38.9
ROAD CULVERT				
	1999	29.2	510.0	269.6
WEST INLET				
	1999	30.5	30.5	30.5
	2000	31.4	34.4	32.9

Table 8.

TOLMAN POND
NELSON

Summary historical and current sampling season Total Phosphorus data. Results in ug/L.

Station	Year	Minimum	Maximum	Mean
EPILIMNION				
	1999	9	11	10
	2000	11	14	12
NORTH INLET				
	1999	11	11	11
	2000	7	8	7
ROAD CULVERT INLET				
	2000	37	99	68
ROAD CULVERT				
	1999	173	173	173
WEST INLET				
	1999	4	4	4
	2000	< 5	9	7

Table 9.

TOLMAN POND

NELSON

Current year dissolved oxygen and temperature data.

Depth (meters)	Temperature (celsius)	Dissolved Oxygen (mg/L)	Saturation (%)
August 8, 2000			
0.1	22.3	8.2	93.9
1.0	22.3	8.2	93.7
2.0	22.2	8.2	93.8
3.0	22.0	8.2	93.5

Table 10.

TOLMAN POND

NELSON

Historic Hypolimnetic dissolved oxygen and temperature data.

Date	Depth (meters)	Temperature (celsius)	Dissolved Oxygen (mg/L)	Saturation (%)
July 28, 1998	2.5	23.5	7.7	89.0
August 10, 1999	3.0	21.9	7.7	87.7
August 8, 2000	3.0	22.0	8.2	93.5

Table 11.

TOLMAN POND

NELSON

Summary of current year and historic turbidity sampling.
Results in NTU's.

Station	Year	Minimum	Maximum	Mean
EPILIMNION				
	1998	0.7	0.7	0.7
	1999	0.5	1.1	0.8
	2000	0.4	0.6	0.5
NORTH INLET				
	1998	0.2	0.2	0.2
	1999	0.8	0.8	0.8
	2000	0.6	0.7	0.6
ROAD CULVERT INLET				
	2000	3.1	9.3	6.2
ROAD CULVERT				
	1999	16.6	16.6	16.6
WEST INLET				
	1999	1.0	1.0	1.0
	2000	0.1	0.5	0.3